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June 20, 2003

Mr. Michael D. Holland
Manager, Brookhaven Area Office
U.S. Department of Energy
Building 464
Upton, NY 11973

Dear Mr. Holland:

SUBJECT: Accelerator Readiness Review (ARR) Recommendation for Routine Operations of the NASA Space Radiation Laboratory

Attached for your review is the report of the Accelerator Readiness Review Team that reviewed the preparation of the Collider-Accelerator Department (C-AD) to commence routine operations of the NASA Space Radiation Laboratory (NSRL). This review was conducted in compliance with the provisions of DOE Order 420.2, *Safety of Accelerator Facilities*, and the BNL Accelerator Safety Subject Area.

The team finds that C-AD is prepared to begin routine operations as defined in the approved Safety Assessment Document and as allowed in the NSRL Accelerator Safety Envelope. The Team has recommended to me that permission be granted for C-AD to proceed with routine operations.

In accordance with DOE and BNL requirements, your authorization is also required for this effort to proceed, and is therefore requested.

If you have questions, please contact Edward Lessard on ext. 4250, or Bob Casey, the ARR Team Leader, on ext. 4654.

Sincerely yours

Thomas R. Sheridan
Deputy Director, Operations

Attachment
cc: P. Paul
D. Lowenstein
E. Lessard
R. Casey
P. Kelley

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Memo

date: June 19, 2003

to: T. Sheridan

from: R. Casey

subject: NSRL ARR Report – Verification for Routine Operations

The ARR Team has completed its verification (see attached report) of the readiness of the Collider Accelerator Department to routine operations of the NASA Space Radiation Laboratory (NSRL).

It is the view of the ARR Team that the Collider Accelerator Department is ready to begin these activities and we recommend that you authorize routine operations.

Please let me know if you have any questions.

cc. E. Lessard
P. Kelley – DOE Facility Representative
H. Kahnhauser
M. Davis - ARR Team Member
T. Monahan - ARR Team Member
S. Stein - ARR Team Member
J. Wishart – ARR Team Member

NASA Space Radiation Laboratory

Accelerator Readiness Review

Routine Operations

June 18, 2003

Signature Page

A committee, consisting of the personnel listed below, was charged by the Deputy Director of Operations on May 9, 2002 to perform an Accelerator Readiness Review (ARR) of the NASA Space Radiation Laboratory (NSRL). This review was conducted in three parts:

1. Beam line commissioning consisting of extraction of the beam from Booster and transport to the NSRL beam stop
2. Commissioning of the experimental program
3. Routine Operation

This review is for Routine Operation and was conducted in compliance with the provisions of DOE Order 420.2, *Safety of Accelerator Facilities* and the Brookhaven National Laboratory Accelerator Safety Subject Area.

Committee member signatures below denote concurrence with the conclusion that NSRL is ready for routine operation.

Casey, Robert (NSLS) W. R. Casey 6/19/03

Davis, Mark (EWMS) Mark C. Davis 6/19/03

Monahan, Terry (SHS) T. Monahan 6/19/03

Stein, Steve (QPSO) Steven Stein 6/19/03

Wishart, Jim (CO) W. J. Casey 6/20/03
for Jim Wishart

I. Introduction

The Accelerator Readiness Review Team for the start-up of the NASA Space Radiation Laboratory (NSRL) was appointed by the Deputy Director for Operations on May 9, 2002. The review was planned from the beginning to consist of three phases: 1) initial extraction from Booster and transport to the facility target room; 2) commissioning of the experimental program; and 3) routine operations.

A detailed review of the first phase of the commissioning process for this facility was conducted in the fall 2002. The report of this review was transmitted to the Deputy Director for Operations on September 16, 2002. Closure of all items was confirmed in a letter to the Deputy Director dated October 18, 2002. The reader is referred to those documents for additional details regarding the ARR process and the findings of the Phase I review.

The ARR for the Phase II Commissioning of NSRL was conducted in two parts during March and April, 2003. The reports of these reviews were transmitted to the Deputy Director for Operations on April 2, 2003 and April 14, 2003.

This phase of the review was conducted to determine that all required program elements necessary for the commencement of routine operations in the NSRL are in place and that all previous commitments have been successfully addressed.

Guidance for the ARR process was provided by DOE Order 420.2 Safety of Accelerator Facilities; the draft Accelerator Safety Implementation Guide and the BNL SBMS Subject Area on Accelerator Safety.

II. Scope of Review

The ARR Team's charge for this review is to determine if the Collider Accelerator Department (CAD) is prepared to begin routine operations within the facility. The following items had been identified by CAD as required prior to routine operation:

1. All ESRC, ASSRC and RSC items relevant to routine operations are closed.
2. The NSRL access-control system is operational and tested.
3. Emergency procedures are complete.
4. Operations procedures are complete.
5. RSC and ESRC check-off lists are prepared.
6. ASSRC check-off list is prepared.
7. Accelerator Safety Envelope is complete.
8. Sweep procedures are complete.
9. Facility specific training for users is developed and implemented.
10. Training records for operations staff is complete.
11. Training records for users is complete.

Prior to the beginning of this review, CAD reported that all items were complete and that the facility was ready for routine operations. The ARR team requested that the following topics be discussed at the opening meeting of this review:

a. Review of items listed above
b. summary of the status of previously open items
c. review of activities conducted during Phase II commissioning
d. review of fault studies
e. experimental safety review program, particularly including the process for review of animal handling and irradiation
f. process for ensuring training of users
g. Radiological Control Division involvement
h. summary of tier 1 inspections in Bldgs. 956-58 for the past 9 months and future plans for providing expertise for animal handling

ARR Team Members

The ARR team consisted of five members - their affiliation and primary areas of review are listed below.

Name	Affiliation	Primary Responsibility for Routine Operations Review
R. Casey	NSLS Department	Review of fault study
M. Davis	Environmental & Waste Management Services Division	Experimental Safety Review & TLD area monitoring program
T. Monahan	Safety & Health Services Division	Status of items in tracking system
S. Stein	Quality Programs & Services Office	Operational Procedures
J. Wishart	Chemistry Department	Review of fault study

P. Kelley from the local Brookhaven Area Office of the DOE participated as a team member in the review and provided DOE oversight of the process and findings.

III. Readiness Determination

The ARR team agrees that the CAD is ready to begin routine operation of the NSRL. There are no items that require tracking by the ARR team or Laboratory management prior to the commencement of routine operation.

IV. Summary of topic areas reviewed by team

A detailed presentation was made by CAD at a meeting on 6/9/03. A copy of the agenda and selected presentations demonstrating readiness are included in this report as Attachment 1, 2, and 3. The ARR Team members were satisfied with the completeness of the presentations and the readiness of the facility.

Following the opening meeting, several items listed below were selected by the ARR team for follow-up to confirm completeness and adequacy of closure. (It should also be noted that the ARR team had confirmed closure previously for a number of program elements during the Phase 1 and 2 commissioning reviews.)

- Operational procedures
- Fault studies
- Experimental safety review
- TLD area monitoring
- Closure of items in tracking system

A summary of the items evaluated during this review is presented below. The individual reports of the ARR team members are included in attachment 4.

Fault studies were conducted as described in an approved fault study plan during April, 2003. The results demonstrated that faults during normal operations produced low radiation levels in occupied area that were consistent with SAD evaluations and within BNL radiological requirements. The fault study also included projections for radiation levels produced by accidental transport of high intensity protons (1×10^{14} p/s) into the NSRL transport line. Such a fault would produce radiation levels in occupiable areas on the order of 1 Rem/hr. The radiation monitors (chipmunks) placed in each labyrinth would sense this sharply increased radiation field and terminate beam within a few seconds. This fault condition has been reviewed by the AGS Radiation Safety Committee and deemed to create acceptable risk.

Erosion of a portion of the berm above the NSRL transport line that had occurred during the winter was noted in the Phase II commissioning reports. The potential impact of this condition has been reviewed by the CAD Radiation Safety Committee Chair and found to be acceptable to conduct commissioning activities. This location was evaluated during the fault study reported above and was found to be adequately shielded. The erosion will be corrected during the summer, 2003.

Operational procedures required for routine operation of NSRL were examined. The reviewer concluded that all procedures that were needed for the NSRL had been developed and were being managed as required by CAD document control policies.

The **experimental safety review process** for NSRL was reviewed in detail. The process that will be used in NSRL is based on the current successful program used for experiments in the AGS A3 beam line. Documentation flow and specific departmental (Medical , C-A, Biology) and committee (SACR, ECRC, IACUC, etc.) review/approval requirements were examined for experiments at the AGS A3 beam line. The process performed thus far for the upcoming July NSRL runs was also reviewed. It was concluded that an established review and approval process exists for experiments. The process incorporates the appropriate reviews/approvals by the specific departments and committees.

The program for managing TLD area monitors was reviewed. Areas have been selected based on the potential for scattered radiation from specific magnets and beam dumps, and for potential to impact humans. Examples of the areas selected include: on the berm above the 12-degree bending magnet; above the beam stop; tunnel mid-point; on the fence at 0-degrees and 90-degrees from dump, and 90-degrees from bending magnet; inside the two labyrinth entrances; in equipment room by pipe chase. The methodology for placement is based on HP SOP-27 "Area Radiation Monitoring With Passive Monitoring Devices". It was determined that an established process for determining the placement of TLDs exists and was used for the NSRL facility.

The status of all previous items identified during CAD and ARR reviews that relate to NSRL operations was examined. The review examined the BAF/NSRL Family ATS logbook and the ASSRC Checklist. Several of the NSRL findings were discussed in detail. A small sample of other findings was identified and closure was field verified. CAD has established a robust system for ensuring closure of ESH&Q items (Family ATS). Additionally the CAD has a well-established system to evaluate the continued ESH&Q in these areas (Tier I inspections).

V. Recommendations

The ARR Team recommends that the Deputy Director for Operations authorize Routine Operation status for the NASA Space Radiation Laboratory.